



A qualitative systematic review of the social eating and drinking experiences of patients following treatment for head and neck cancer

Dornan, M., Semple, C., Moorhead, A., & McCaughan, E. (2021). A qualitative systematic review of the social eating and drinking experiences of patients following treatment for head and neck cancer. *Supportive Care in Cancer*, 29, 4899-4909. <https://doi.org/10.1007/s00520-021-06062-7>

[Link to publication record in Ulster University Research Portal](#)

Published in:
Supportive Care in Cancer

Publication Status:
Published (in print/issue): 01/09/2021

DOI:
[10.1007/s00520-021-06062-7](https://doi.org/10.1007/s00520-021-06062-7)

Document Version
Author Accepted version

General rights
Copyright for the publications made accessible via Ulster University's Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The Research Portal is Ulster University's institutional repository that provides access to Ulster's research outputs. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact pure-support@ulster.ac.uk.

Supportive Care in Cancer

A qualitative systematic review of the social eating and drinking experiences of patients following treatment for head and neck cancer --Manuscript Draft--

Manuscript Number:	JSCC-D-20-02001	
Full Title:	A qualitative systematic review of the social eating and drinking experiences of patients following treatment for head and neck cancer	
Article Type:	Review Article	
Corresponding Author:	David Mark Dornan, MA BSc BD RN Ulster University Co Antrim, UNITED KINGDOM	
Corresponding Author Secondary Information:		
Corresponding Author's Institution:	Ulster University	
Corresponding Author's Secondary Institution:		
First Author:	David Mark Dornan	
First Author Secondary Information:		
Order of Authors:	David Mark Dornan Cherith Semple Anne Moorhead Eilis McCaughan	
Order of Authors Secondary Information:		
Funding Information:	Department for the Economy (NI)	Mr David Mark Dornan
Abstract:	<p>Purpose</p> <p>Patients living with and beyond head and neck cancer (HNC) often have long-term, functional challenges as a result of treatment. A key functional challenge relates to eating and drinking; often associated with physical, emotional, and social difficulties. Eating and drinking with family members and friends can become a struggle, increasing the risk of social isolation and loneliness. This systematic review aims to identify and synthesise the literature on the experiences of social eating and drinking for patients following treatment for HNC.</p> <p>Methods</p> <p>Six electronic databases (Pubmed, Web of Science, CINAHL, EMBASE, PsychINFO and Scopus) were systematically searched using subject headings and free-text word searches in February 2020. Citation chaining and Google Scholar were used to identify grey literature. PRISMA procedures were followed.</p> <p>Results</p> <p>Of 6910 records identified, 24 studies met the inclusion criteria. Synthesis of the research findings results in two major themes: 1) the experience of loss associated with social eating and drinking, and 2) adjusting and support to promote social eating and drinking.</p> <p>Conclusion</p> <p>Losses associated with social eating affect a patient's psychological and emotional well-being and impact on close relationships. To promote positive participation in social</p>	

	<p>eating, patients were more likely to seek and receive support from someone within their close social network, rather than a healthcare professional. Family and friends are an essential source of support and are integral in facilitating engagement with social eating following treatment for HNC. Future interventions should promote family orientated resources, incorporating self-management strategies.</p>
Suggested Reviewers:	

[Click here to view linked References](#)

A qualitative systematic review of the social eating and drinking experiences of patients following treatment for head and neck cancer

Mark Dornan, Cherith Semple, Anne Moorhead, Eilís McCaughan

Corresponding Author:

Mr Mark Dornan (MD)

dornan-d@ulster.ac.uk

School of Nursing, Institute of Nursing and Health Research, Ulster University,

Newtownabbey, UK

ORCID : <https://orcid.org/0000-0001-5387-0526>

Dr Cherith Semple (CS)

School of Nursing, Institute of Nursing and Health Research, Ulster University,

Newtownabbey, UK & Cancer Services and Ulster Hospital, South Eastern Health and Social

Care Trust, Belfast, UK

ORCID : <https://orcid.org/0000-0002-4560-7637>

Dr Anne Moorhead (AM)

School of Communication and Media, Institute of Nursing and Health Research, Ulster

University, Newtownabbey, UK

ORCID : <https://orcid.org/0000-0002-8585-2987>

Prof Eilís McCaughan (EM)

School of Nursing, Institute of Nursing and Health Research, Ulster University, Coleraine,

UK

Acknowledgements

The authors would like to thank Kelly McCoo for her support and guidance in conducting the database searches and the internal peer reviewers for their time and comments on the review.

Abstract

Purpose: Patients living with and beyond head and neck cancer (HNC) often have long-term, functional challenges as a result of treatment. A key functional challenge relates to eating and drinking; often associated with physical, emotional, and social difficulties. Eating and drinking with family members and friends can become a struggle, increasing the risk of social isolation and loneliness. This systematic review aims to identify and synthesise the literature on the experiences of social eating and drinking for patients following treatment for HNC.

Methods: Six electronic databases (Pubmed, Web of Science, CINAHL, EMBASE, PsychINFO and Scopus) were systematically searched using subject headings and free-text word searches in February 2020. Citation chaining and Google Scholar were used to identify grey literature. PRISMA procedures were followed.

Results: Of 6910 records identified, 24 studies met the inclusion criteria. Synthesis of the research findings results in two major themes: 1) the experience of loss associated with social eating and drinking, and 2) adjusting and support to promote social eating and drinking.

Conclusion: Losses associated with social eating affect a patient's psychological and emotional well-being and impact on close relationships. To promote positive participation in social eating, patients were more likely to seek and receive support from someone within their close social network, rather than a healthcare professional. Family and friends are an essential source of support and are integral in facilitating engagement with social eating following treatment for HNC. Future interventions should promote family orientated resources, incorporating self-management strategies.

Keywords: *Head and neck cancer, cancer survivorship, eating, social, systematic review*

Introduction

The concept of social eating and drinking is to eat or drink in the presence of another person [1]. Eating and drinking socially is also known as commensality, which in a literal sense means to come together at a table [2-3]. Social eating may take place as a daily activity, with most people eating at least one or two meals with another person each day, primarily, those with whom they live [4, 5]. Eating with colleagues or going to cafés and restaurants to meet friends has become a regular aspect of modern life and an opportunity to bring people together. Social eating and drinking are observed as integral aspects of cultural, religious, and celebratory occasions [6-8].

Literatures illustrates that eating and drinking have a central and significant meaning to peoples' lives [6]. Eating and drinking are observed and enjoyed as more than a physical activity, and its meaning extends beyond the value of nutrition [9]. Sharing meals with others provides the opportunity to engage in everyday casual conversation and to share experiences [6]. Eating socially nurtures relationships and is more likely to make people feel better about themselves, participate in a broader social network and obtain emotional support [4].

For patients with head and neck cancer (HNC), eating and drinking with others, is reported as a significant challenge [10]. Research reports that up to 90% of patients with HNC have eating and drinking difficulties after treatment [11-12]. A potential range of side effects can inhibit a patient's ability to eat and drink, including pain, xerostomia, mucositis, nausea, lack of appetite, dysphagia and dysgeusia [11, 13].

A growing body of evidence indicates the challenges of social eating and drinking for patients with HNC [14-15]. A literature review by Ganzer et al. [14] on the changed meaning of food, identified the importance of the social dimension of food and drink for patients with

HNC. Patients with HNC are at potential risk of social isolation, loneliness and reduced quality of life from the functional eating and drinking difficulties encountered as a result of treatment [15]. There have been no systematic searches or literature syntheses on the experiences of social eating and drinking for patients with HNC. This is a fundamental gap in our current understanding of the survivorship experiences of patients living with and beyond HNC.

A systematic synthesis of the literature will establish opportunities to raise healthcare professionals' (HCP) awareness and inform them of the long-term social eating and drinking adversities encountered by patients with HNC. Furthermore, this review will help identify and consolidate the key areas of support and inform the planning, development, and delivery of evidence-based support to address these challenges. Therefore, the aim of this review is to identify and synthesise the experiences of social eating and drinking of patients living with and beyond HNC. The objectives of this systematic review are:

- To explore the social experiences of eating and drinking of patients following treatment for HNC.
- To identify the support needs surrounding social eating and drinking for patients following treatment for HNC.
- To identify strategies to promote social eating and drinking for patients following treatment for HNC.

Methods

The systematic review followed an *a priori* protocol adhering to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) [16]. The systematic review protocol was registered on with the International Prospective Register of Systematic Reviews (PROSPERO) with registration number CRD42020162875.

Search strategy

Six electronic databases were used to identify relevant literature: Pubmed, Web of Science, Cumulative Index of Nursing and Health (CINAHL), Excerpta Medica Database (EMBASE), PsycINFO and Scopus. The search terms were developed from the key concepts of the review aim: “*head and neck cancer*”, “*eating and drinking challenges*” and “*experiences*”. Free-text word searches and subject heading searches were used as appropriate to each database to ensure a comprehensive search. The final list of terms was clarified with an experienced librarian, confirming a systematic approach was undertaken between different databases. Grey literature was reviewed from Google Scholar to ensure complete coverage. Citation chaining was used to identify eligible works from the references of the included studies. ‘Wildcards’ were also used to search for partial words, alternative spellings, and pluralisation. All searches were completed on 17th February 2020. The database searches are displayed in Appendix 2. All results were collated in RefWorks.

Study eligibility

Study inclusion criteria consisted of: 1) patients aged 18 years and over who had completed treatment for HNC, 2) research described a patient’s experience of social eating and drinking, 3) the publication was primary research. Studies were excluded as follows: 1) secondary research (e.g., reviews, opinion articles, editorials), 2) papers reporting on the physical and

functional impact of HNC only without reporting the social experiences of eating and drinking relating to HNC, 3) studies that report on more than one type of cancer, where findings cannot be separated to results of an HNC cancer group. Retrieved studies were published in English from January 2009 to December 2019 to obtain current evidence on this survivorship challenge for patients with HNC.

Screening

Duplicates were removed. Titles and abstracts were reviewed using the eligibility criteria by one reviewer (MD). This process was checked by a second reviewer (CS). Full-text papers were obtained for studies meeting the eligibility criteria or if the eligibility could not be determined from the title and abstract screen. Two authors were contacted for clarification of their work. Full-text papers were screened using a screening tool developed by the research team to assess eligibility and to ensure rigour (Appendix 3). Included papers were verified by CS, and a decision on indeterminate studies was reached by discussion with CS. This process is displayed in Figure 1.

Data extraction and synthesis

The following characteristics were extracted from the included studies by the first author (MD): author(s), year, country, study aim(s), research design, data collection methods, sample number and characteristics and key finding(s), displayed in Table 1. Relevant findings from each paper were extracted verbatim into a spreadsheet. Research findings were synthesised using *Thomas and Harden's* [17] three-step approach to thematic analysis. Initial codes were generated in the first instance by using a word or phrase to describe the finding. This was completed in an iterative process. These codes were then grouped into descriptive themes using an inductive approach as there were no predetermined categories in which data should be placed. Finally, the descriptive codes were developed into analytical themes through a cyclical process and

discussion. The final analytical themes were refined by the research team (MD, CS, AM, EM) and checked by rereading each paper to ensure they reflected the meaning and essence of the literature.

Quality assessment

Each paper was quality assessed using the Critical Appraisal Skills Programme (CASP) [18] tool by MD and verified by CS. The CASP tool is a commonly used method to appraise studies in qualitative synthesis and consider research transparency and methodological appropriateness [19]. Each response in the CASP tool was assigned a numerical value (Yes=1, Can't tell=0, No=0). A total score was then calculated for each included study with a maximum possible score of 9. A summary table is included in Appendix 4. Any differences of opinion were resolved by discussion.

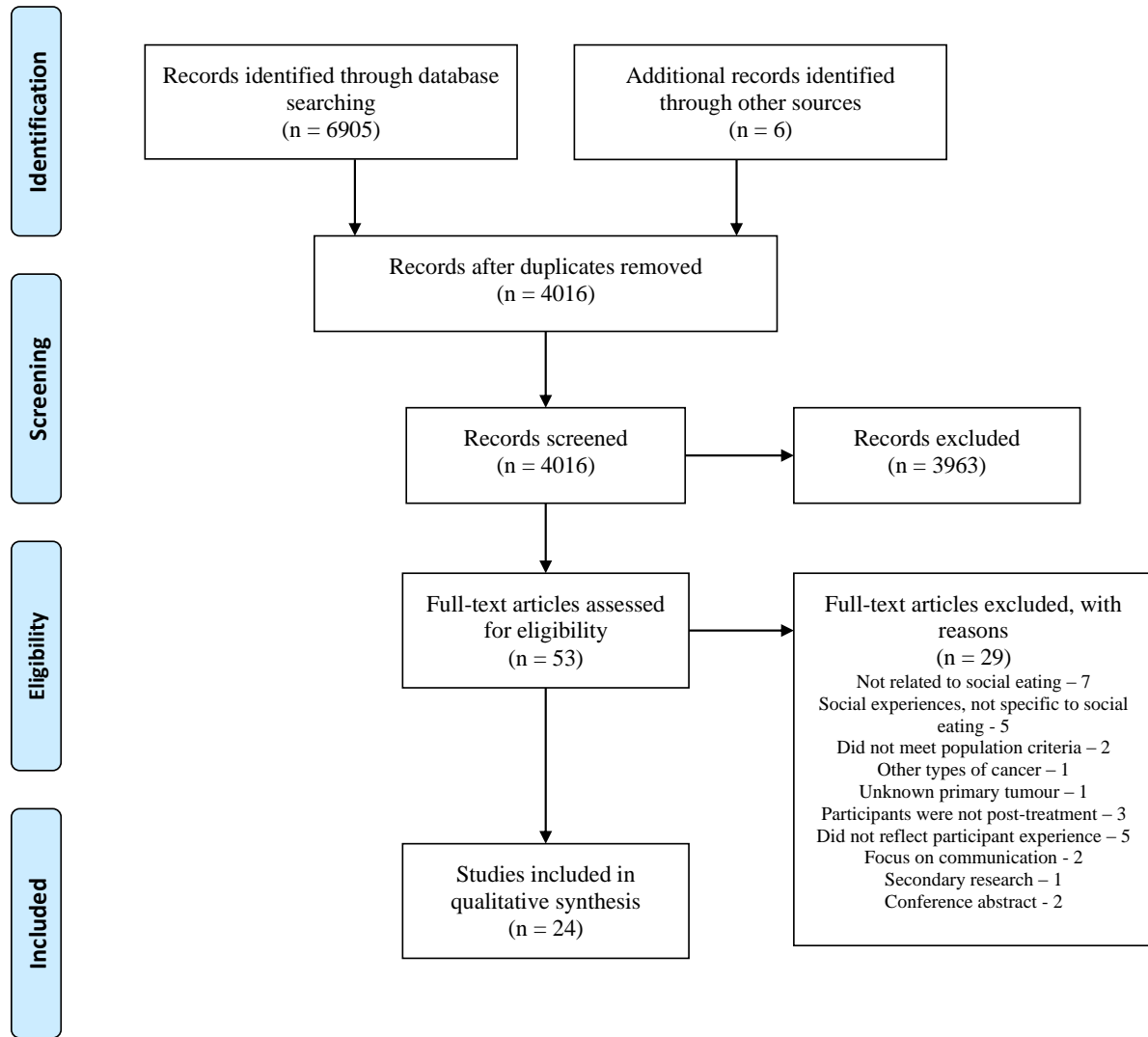


Figure 1. PRISMA flowchart

Results

The search identified 6905 records (Pubmed (n=1091), Scopus (n=1437), PsycINFO (n=57), CINAHL (n=631), Web of Science (n=1373), EMBASE (n=2316)) with 4015 remaining after the removal of duplicates. In total, 53 titles met the eligibility criteria to have a full-text screen. Subsequently, and after a further screening, 25 articles were excluded. Four further papers were later discussed with CS and on agreement, subsequently eliminated from the final inclusion as they did not meet the eligibility criteria. The final total number of papers included was 24. A member of the research team verified each included study. A record of the decision to include and exclude papers with reason was kept. Reasons for exclusion are included in Figure 1. All the included studies reported findings on patients experiences of social eating and drinking after treatment for HNC.

Participants

Within the 24 included studies, a heterogenous HNC population of 516 patients (male=379, female=137) was identified. Sample sizes ranged from 6 to 135. These included participants diagnosed across a range of tumour locations such as oral cavity, tonsil, larynx, and pharynx, of various stages and receiving different modalities of treatment. Twenty-one studies included patients from different HNC subsites. Three papers focused on patients with one type of HNC: oral cancer [27], tonsil cancer [32], tongue cancer [43]. Within the studies, the treatment a person received resulted in unique physical and functional effects, both in the acute and long-term recovery that impacted social eating and drinking. Some patients living with an obturator following a maxillectomy experienced nasal leakage and altered chewing [40]. Whereas dental loss, often contributed to issues with biting, swallowing and talking [37]. Partial glossectomy frequently led to limited tongue mobility [43], and a common side-effect following radiotherapy was xerostomia [35]. Other functional challenges

that directly impacted on HNC patients' ability to participate in social eating and drinking activities were: coughing [23, 25, 36], noise from eating and swallowing [31], swallowing difficulties [33, 38, 42] and, oral incontinence [23, 40]. The physical and functional challenges people encountered with eating and drinking led to an altered eating experience [21].

Results of synthesis

Two themes were developed to illustrate the reported social eating and drinking experiences for patients with HNC: 1) the experience of loss associated with social eating and drinking and 2) adjusting and support to promote social eating and drinking.

Theme 1: The experience of loss associated with social eating and drinking

Physical alterations for patients with HNC had significant repercussions on their ability, perceived ability, and confidence to engage in social activities involving food and eating. Patients regarded their experience of social eating as a loss. The experience of loss is depicted across three subthemes: 1) loss of ability and confidence to eat in a socially acceptable way 2) loss of social participation and enjoyment associated with normal eating and drinking and 3) loss of togetherness with family and friends. For the context of this review, social eating refers to both eating and drinking.

Table 1. Data extraction table

Author(s), year and country	Study aim	Research design	Data collection	Sample characteristics	Main study findings
Alberda et al. (2017) [20] Canada	To explore patients' perspectives on nutrition care in the context of their illness, medical treatment, and recovery	Qualitative	Semi-structured interview	20 participants, 10 with oesophageal cancer (8 male & 2 female) 10 with HNC (8 male & 2 female). Age range 45-79 years. Treatment: surgery only - 1; RT only - 1; surgery/RT/CT - 12; surgery/RT - 6.	1) Coping with physical and psychosocial aspects of illness and nutrition; 2) understanding the nature of the illness, treatment and nutrition pathway and 3) being supported during the trajectory of care.
Burges-Watson et al. (2018) [21] England, UK	To create a multi-dimensional framework to facilitate systematic assessment and development of a comprehensive intervention	Qualitative	Video-reflexive ethnography	25 participants with HNC (14 male & 11 female) and partners. Age range 54-65. Treatment: (chemo)radiotherapy – 25.	The development of an altered eating framework to assess a patient's relationship with food over 7 domains after treatment for HNC.
Checklin et al. (2019) [22] Australia	To investigate patients' perspectives on their experience of oropharyngeal dysphagia rehabilitation after treatment for HNC	Qualitative	Semi-structured in-depth interview	8 participants with HNC (6 male & 2 female). Age range 51-75 years. Treatment: surgery only – 7; surgery and RT – 1.	1) The supportive network is essential; 2) reassurance from staff professionalism; 3) access to service; 4) using own motivation and resilience; 5) receiving the right information; 6) need for future research.

Dooks et al. (2012) [23] Canada	To describe the experience of community reintegration following laryngectomy surgery	Qualitative	In-depth interview	9 participants who had total laryngectomy surgery (8 male & 1 female). Age range 60-75 years. Treatment: total laryngectomy surgery and RT – 9.	There was constant accommodation to life with a laryngectomy. Three main themes: 1) impact of cancer diagnosis; 2) coping with illness and 3) transitions to recovery.
Dunne et al. (2019) [24] Ireland	To describe the ways in which HNC survivors begin to integrate self-management into their daily lives	Qualitative	Semi-structured interview	27 participants with HNC (18 male & 9 female). Age range 25-70+ years. Treatment: surgery & RT – 10; surgery, RT & CT – 11; RT & CT – 6.	1) Grappling with self-management; 2) trying different strategies; 3) becoming an expert; 4) struggles; 5) avoiding recommendations and 6) interpreting self-management.
Einarsson et al. (2019) [25] Sweden	To describe patients' experiences of food and eating two years after treatment and how they cope	Qualitative	Thematically structured interview	135 patients with HNC (100 male & 35 female). Age range 34-87 years. Treatment: RT – 49; surgery – 4; RT then surgery – 34; surgery then RT – 29; CT, RT and/or surgery – 19.	1) The constant battle; 2) food alterations and nutritional support; 3) not joining in; 4) coping; 5) relationships and 6) longing for 'normality'.
Ganzer et al. (2015) [26] USA	To explore the eating experience of survivors of HNC up to 3 years after chemoradiation	Mixed methods	Interview & Vanderbilt Head and Neck Symptom Survey 2.0	10 patients with HNC (7 male & 3 female). Age range 40-67 years. Treatment: induction CT – 7; concurrent chemoradiation (CCR) therapy only – 1; CCR and surgery – 2; induction CT, CCR, surgery – 3; concurrent chemotherapy – 10.	1) The psychological impact; 2) functional impact; 3) social impact and 4) eating experience. These were encompassed by the overarching need to adapt.
Goswami & Gupta (2019) [27] India	To understand the problems faced by patients with oral cancer from diagnosis until end of treatment	Qualitative	In-depth interview	24 patients with HNC (18 male & 6 female). Age range 35-82. Treatment: Surgery and RT – 8; surgery, RT and CT – 7; surgery,	Post treatment challenges included: 1) concerns for quality of life; 2) social constraints; 3) financial security and 4) feeding problem.

				RT and PL – 2; RT, CT and PL – 2; surgery, RT, CT and PL – 5.	
Jiang et al. (2017) [28] China	To describe the experience of radiation-induced xerostomia in the daily lives of Chinese patients with HNC	Qualitative	Semi-structured interview	20 patients with HNC (13 male & 7 female). Age range 29-80 years. Treatment: RT and adjuvant CT – 6; RT only – 5; concurrent CT – 5; RT and surgery – 2; surgery, CT and RT – 2.	Five categories identified in relation to xerostomia from HNC treatment: 1) communication problems; 2) physical problems; 3) psychosocial problems; 4) treatment problems and 5) relief strategies.
McQuestion et al. (2011) [29] Canada	To explore the experiences of patients' receiving radiotherapy and the disruptions caused by treatment	Qualitative	Interview	17 patients with HNC (12 male & 5 female). Age range 30-70+ years. Treatment: Daily RT – 17; BID radiation – 5.	The meaning of food had changed and was evident in three aspects of people's lives: 1) physical; 2) emotional; 3) social.
Molassiotis and Rogers (2012) [30] England	To explore experiences, over a one year period, of issues and concerns described by patients with HNC	Qualitative	Semi-structured interview	16 patients at T1 (14 male & 2 female), 13 at T2, 12 at T3 and 10 at T4 with HNC. Age range 34-80 years. Treatment: RT – 8; CT and RT – 4; surgery – 4.	Four prominent issues reported up to one year by patients: 1) nutritional concerns; 2) tiredness; 3) the radiotherapy mask; 4) regaining 'normality'.
Moore et al. (2014) [31] Australia	To explore the experiences of patients who received treatment for HNC, describe support needs and managing unmet needs	Qualitative	Semi-structured interview	8 patients with HNC (7 male & 1 female). Age range 51-60 years. Treatment: CT – 3; surgery & RT – 2; surgery, RT & CT – 3.	Findings were organised using the stress, appraisal and coping model and describe the areas for support and the negative impact on quality of life post-treatment.
Mortensen & Paaske (2012) [32] Denmark	To explore the long-term quality of life of people who have tonsil cancer	Qualitative	Semi-structured interview	7 patients with tonsil cancer (3 male & 4 female). Age range 54-65 years. Treatment: RT and surgery – 4, RT, CT and surgery – 3.	The side effect of treatment was greatest at three months after treatment. People reported impact on QoL even two years after treatment.

Nund et al. (A) (2014) [33] Australia	To explore the lived experience of the impact of dysphagia following HNC management	Qualitative	Interview	24 patients with HNC (20 male & 4 female). Age range 43-71 years. Treatment: RT + systemic therapy -23; RT only – 1.	Four main themes of the experience of dysphagia following treatment: 1) physical changes; 2) emotions response; 3) altered meaning of food; 4) personal and lifestyle impacts.
Nund et al. (B) (2014) [34] Australia	To explore the experience of dysphagia following non-surgical treatment for HNC the perceptions of service needs	Qualitative	Interview	24 patients with HNC (20 male & 4 female). Age range 43-71 years. Treatment: RT + systemic therapy -23; RT only – 1.	There are five interrelated themes to this study: 1) life after treatment; 2) practical adjustments living with dysphagia; 3) emotional adjustments; 4) accessing support outside the hospital and 5) perceptions of dysphagia related services.
O'Brien et al. (2012) [35] Ireland	To explore the experiences of change within intimate relationships due to HNC	Qualitative	Semi-structured interview	16 patients with HNC (12 male & 4 female). Age range 35-71). Treatment: surgery only – 5; surgery + RT – 8; surgery + chemo-radiotherapy – 1; chemo-radiotherapy – 2.	Three major themes demonstrate the changes in intimacy of relationships following treatment: 1) personal identity; 2) re-establishing social networks and 3) intimate relationships.
Ottosson et al. (2013) [36] Sweden	To describe the experience of food, eating and meals after radiotherapy treatment for HNC	Qualitative	Interview	13 patients with HNC (11 male & 2 female). Age range 47-70 years. Treatment: RT only – 6; RT + surgery – 7.	Findings suggest six post-treatment categories of patients' experience: 1) a long journey; 2) a new way of eating; 3) eating without satisfaction; 4) challenging meals outside the family; 5) support and information and 6) a new normal.

Parahoo et al. (2019) [37] Northern Ireland	To explore the experience of dental loss in patients with HNC	Qualitative	Semi-structured interview	15 patients with HNC (10 male & 5 female). Age range 51-80 years. Treatment: RT – 2; RT + CT – 3; surgery + RT – 7; surgery + RT + CT – 2; surgery only – 1.	Post-treatment experiences include: 1) impact of dental loss; 2) coping with dental loss and 3) getting dentures and implants.
Pateman et al. (2015) [38] Australia	To describe how people with HNC cope with altered oral function and to identify their supportive care needs	Qualitative	Semi-structured interview	6 patients with HNC (4 male & 2 female). Age range 50-72 years. Treatment: RT + CT – 3; surgery – 1; surgery + RT – 2.	Three key themes describing patient experiences of altered oral function: 1) dimensions of eating; 2) maintaining oral health and 3) adapting to the chronic side effects.
Patterson et al. (2015) [39] England	To describe HNC patients' experiences of change of swallowing challenges following chemoradiotherapy	Qualitative	12 patient observations, 4 with partner present. 6 individual interviews and 3 dyad interviews.	Phase 1: 12 patients with HNC (10 male & 2 female) and 4 partners. Age range 45-77. Treatment: CT – 10; RT – 2. Phase 2: 9 patients with HNC (8 male & 1 female) and 3 partners. Age range 50-72 years. Treatment: CT – 7; RT – 2.	Findings include early post treatment and late post treatment experiences. Eating and drinking issues are highly individualised and have pervasive physical, social and practical aspects.
Semple et al. (2019) [40] Northern Ireland	To explore the long-term impact of living with an obturator to rehabilitate a maxillary defect	Qualitative	Semi-structured interview	12 patients with HNC (8 male & 4 female). Age range 38-84. Treatment: surgery only – 7; surgery + RT – 4; surgery + RT + CT – 1.	The experience of living with an obturator are demonstrated across: 1) preparedness for living with an obturator; 2) impact of living with an obturator; 3) stability and retention of an obturator and 4) coping strategies.
Sterba et al. (2017) [41] USA	To characterize primary end-of-treatment challenges in HNC to assist the development of a	Qualitative	Semi-structured interview	17 patients with HNC (10 male & 7 female). Age range 33-75 years. Treatment: surgery – 82%; CT – 59%; RT – 82%.	The findings highlighted the post-treatment physical, emotional and social challenges and a wide variety of complex follow up care

	survivorship needs assessment planning tool			14 caregivers (6 male & 8 female). Age range 29-83.	experiences and testing of the Survivorship Needs Assessment Planning (SNAP) tool.
Tong et al. (2011) [42] Hong Kong	To gain patients' perspectives and experiences of post-irradiation swallowing difficulties	Mixed-methods	Semi-structured in-depth interview and self-report questions	60 with nasopharyngeal cancer (42 male & 18 female). Age range 34-71 years. Treatment: RT – 60.	Post-irradiation experiences include: 1) patient judgement of swallowing difficulties; 2) definitions of a normal diet; 3) the perceptions of 'no difficulties' and 4) little attention paid to dysphagia symptoms.
Zou et al. (2015) [43] China	To understand how treatment for tongue cancer affects daily life at one year following glossectomy with free flap reconstruction	Qualitative	Semi-structured interview	16 male patients with tongue cancer. Age range 34-64 years. Treatment: partial glossectomy and free thigh flap reconstruction – 16.	Patients described physical, social, relational and emotional changes, change to sexual practice and use of traditional Chinese medicine.

RT: Radiotherapy; CT: Chemotherapy; PL: Palliative therapy.

Theme 1.1: Loss of ability and confidence to eat and drink in a socially acceptable way

The effects of HNC and the impact of treatment regularly prevented people from sharing meals in a social situation [28-29, 38]. Often, patients perceived they had lost the ability to eat and drink with others in a socially acceptable way. Patients felt embarrassment, shame and were self-conscious about not being able to control their physical symptoms, such as drooling and nasal leakage; highlighting how this led to ‘making a mess’ in social situations [21, 24-25, 31, 36, 38-40]. Selecting food to eat became a conscientious process, and patients felt unable to eat like a “normal” person [25, 27, 33]. Occasionally patients became anxious when they were invited to someone’s house. They had a fear of insulting the host if they were unable to eat the food being served but also did not want attention drawn to the situation, with a ‘fuss’ being made over not being able to eat or drink [28, 36, 39].

Theme 1.2: Experiencing loss of participation and enjoyment associated with social eating and drinking

Participants reported eating less regularly with others after their treatment and for some, this was such a challenge that they excluded themselves from social occasions and chose to remain at home [24, 28-29]. Meeting with friends and family in restaurants or cafés became a less common occurrence [25, 31, 39]. Patients reported that they refrained from attending special celebrations, such as weddings [37, 39-40], Christmas [40] and New Year parties [28] due to the functional and psychological challenges of eating and drinking. This sometimes extended to the type of holidays people were able to take [33]. Not participating in social eating activities restricted patient’s social lives and often isolated them from others [38-39].

Some patients, however, who attended social eating events appeared to not have the same sense of enjoyment as before treatment and believed that they no longer made the same contribution to the social environment [25, 30, 43]. For example, residual impairment meant that people

1 were unable to talk and eat at the same time, which made engaging in mealtime
2 conversation more arduous [25-30]. Additionally, the noisy surroundings in restaurants were
3 not conducive to conversation and therefore required more effort to participate [22-23]. The
4 uncertainty of the availability of suitable food resulted in diminished enjoyment when eating
5 out, and participants regarded this as a loss [23, 35, 42]. The loss of social participation was
6 not solely limited to going out of the house to eat and drink but also impacted mealtime
7 participation at home.
8
9
10
11
12
13
14
15
16
17
18

19 Theme 1.3: Experiencing loss of togetherness with family and friends

21 The findings demonstrated that following HNC treatment, patients shared meals less frequently
22 with family and friends, which had an impact on relationships. Regular meals at home were no
23 longer shared as a family, and patients ate separately as family members felt guilty or
24 uncomfortable enjoying a meal that the person could not share [21, 33, 41]. Consequently,
25 patients experienced a loss of togetherness with their friends and family [33]. Family members
26 became irritated at the length of time it took to eat a meal, which affected their relationship
27 [42]. The process of eating often required more time which could result in the
28 patient remaining at the table alone to finish their meal and consequently feeling more
29 isolated [31, 36, 42]. Some patients indicated that they no longer received invitations to social
30 events from friends or family members, as eating would be involved [26]. For this reason,
31 patients reported to be less motivated to socialise with others [31]. The loss of togetherness
32 extended from friends, family, spanning to work colleagues [40].
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52

53 Theme 2: Adjusting and coping to promote social eating

54 Despite the challenges and the associated losses caused by HNC treatment, over time, many
55 patients found methods of adjusting and adapting to enable coping with social eating [43].
56
57
58
59
60
61
62
63
64
65

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

Some of the coping strategies demonstrated by patients, such as avoidance and isolation limited their participation in social eating opportunities [28, 40]; however, alternative methods of adapting facilitated positive participation with eating socially. By adopting adjustment strategies, some people were able to reduce social embarrassment and disruptions to their social eating [43]. This was demonstrated by the two themes: 1) taking control of the social eating situation and 2) engaging with support.

Theme 2.1: Taking control of the social eating situation

Being candid about their cancer and describing how the disease affected their eating and drinking helped demonstrated ownership over their situation [25]. When going to restaurants, some patients would ask for discrete places to sit to be able to eat more privately and feel less conspicuous [25, 39-40]. Others contacted restaurants in advance to ensure there would be food that they would be able to eat [38]. This extended to going on holidays where they could ensure food preparation met their individual needs. Cruises appeared to be a good option [33]. Food modification was a crucial aspect of coping with social eating and drinking challenges. Smaller, more comfortable to swallow foods were prepared to control symptoms or finish at the same time as others [26, 29]. Sometimes, more palatable food would have been requested; less spicy, dry, or acidic [25-26]. Alternatively, bringing their own supply of items such as custards, sauces, and gravies to modify meals made food more manageable in restaurants [34, 36]. To participate socially, on occasions, patients had to choose less appetising options [26].

At social gatherings, some patients would eat alone or requested family members to eat before them [39-40]. Alternatively, some patients would eat in their own homes prior to meeting friends or family. This ensured they could eat their food but still participate and gain

1 value from spending time with those in their social network [25, 40]. Others would choose
2 to invite friends and family to their house instead of going out in order to take control of the
3 food that was available [37].
4
5
6
7

8 Theme 2.2: Engaging with support

9
10 While patients demonstrated a range of strategies in which they employed to cope with the
11 physiological, psychological, and social aspects of eating, support from family and friends
12 was paramount. In these circumstances, friends and family were generally described as
13 supportive, helpful, and encouraging [25]. Some ways family members were able to support
14 people included adapting meals, cooking alternative meals and the alteration of eating patterns
15 by the patient's spouse [25, 33].
16
17
18
19
20
21
22
23
24
25
26
27

28 Following treatment some individuals reported feeling a sense of security when eating with
29 family and close friends, as this alleviated stress and promoted confidence at mealtimes [25,
30 36]. For parents of young children, mealtimes were a positive experience as they were
31 cooking, feeding or entertaining the children, which provided a sense of purpose and
32 meaning [39].
33
34
35
36
37
38
39
40
41
42

43 There was little evidence of support received from HCPs to help promote patients' experience
44 of social eating. There were some indications of how HCPs could respond to the social eating
45 challenges for people living with and beyond HNC. These included adopting holistic
46 approaches providing education beyond the physical side effects of functional challenges and
47 nutritional status of food items throughout the trajectory of recovery [25, 34, 37].
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

Discussion

This is the first systematic review synthesising the social eating and drinking experiences for patients following treatment for HNC. The findings articulate an array of essential losses for patients following HNC, including a loss of confidence to eat socially, loss of taking part in social events and loss of family togetherness. This review identified that patients were more likely to seek and receive support from someone within their close social network, rather than an HCP. The essential role of family during recovery and in cancer survivorship is highlighted. This body of literature primarily demonstrates the challenges associated with social eating and drinking after HNC treatment, with minimal findings on strategies to positively promote eating socially representing a gap in the current evidence-base.

Within the findings, it was reported that the social network with whom patients ate changed after treatment. Unfortunately, for some patients, mealtimes were no longer a social occasion and was viewed as a significant loss [44]. Eating was missed because of the taste and flavour of food; however, people chiefly mourned the loss of inclusion and belonging that food brings, including cultural and personal identity [21]. Challenges with social eating can inhibit the meaning of meals and restrict family togetherness within the home [44-45]. There is a potential risk of reduced quality of life for patients with HNC who have challenges with eating and drinking. The functional challenges of HNC treatment and lack of social integration place people at risk of social isolation, loneliness, and poorer health-related quality of life [46-47].

Wittmann et al. [48] described the interconnected biopsychosocial losses and successive feelings of grief in patients and partners after treatment for cancer. In viewing social eating and drinking challenges as a process of grief as opposed to a one-time event, it reframes the concept as an area that requires ongoing acknowledgement and potential continued support. Patients

1 undergoing treatment for HNC may not be fully prepared or anticipate the ongoing functional
2 challenges resulting from treatment [40]. For many patients, functional side effects can
3 improve over time, however for some, it is slow, and for others, they never regain pre-treatment
4 function [49-50]. Social eating can continue to be a problem beyond 12 months post-treatment
5 and a contributing factor to overall inferior quality of life [51]. Living with cancer as a chronic
6 illness is a life-long process that requires adaption and change [52]. Some patients may come
7 to the point of acceptance; however, additional research should examine the change of
8 perception and experience of social eating across the trajectory from diagnosis to acute and
9 long-term recovery.
10
11
12
13
14
15
16
17
18
19
20
21
22
23

24 An assessment tool developed by Burges-Watson et al. [21] provides a holistic framework of
25 assessment for patients with altered eating challenges, recognising the biological causes,
26 psychological consequences, and social impact. As there are a wide variety of activities
27 associated with eating and drinking, HCPs must ensure eating and drinking needs of patients
28 are explored beyond the physical domains. Patients reported a range of emotional reactions
29 relating to social eating such as frustration, irritation, and anxiety. However, there is a paucity
30 of information on how people coped with any emotional pain. Given the biopsychosocial
31 challenges that accompany eating and drinking with others, a multi-disciplinary approach is
32 required to ensure support extends beyond the mechanical and functional tasks of eating and
33 drinking. Future research must consider how people cope beyond the physical and practical
34 adjustments that they make, investigating the psychological, emotional, and relational domains.
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52

53 Families are at the core of social eating and the key support providers for people with HNC
54 [1]. Despite, sometimes feeling misunderstood, the assistance of family and friends was
55 invaluable to overcoming social eating challenges and often the primary source for patients to
56
57
58
59
60
61
62
63
64
65

1 seek support [46, 55]. As close relationships appear to be the most important means of support,
2 it is essential to explore and understand the experience of family and close friends. Strategies
3 for communal coping should be developed as both members of a relationship are involved with
4 managing chronic illness [54]. Existing research by Patterson et al. [45] and Nund et al. (C)
5 [55] explicitly investigate the experiences of family members of people with social eating
6 challenges after treatment for HNC and conclude the potential burden of caring for someone
7 with functional eating and drinking challenges. The need for feasible and acceptable family-
8 based interventions has been previously indicated [56].
9
10
11
12
13
14
15
16
17
18
19
20
21

22 Given the wide-ranging impact of altered eating and drinking, it is imperative that studies
23 investigate possible interventions that provide meaningful approaches to facilitate positive
24 social participation in eating and drinking environments for patients and family members.
25
26 Whittemore and Dixon [57] suggested that the key to managing a chronic illness is self-
27 integration. Whilst coping, integration and adjustment were demonstrated by participants in
28 these findings, there was little detail on the process of acceptance or self-management. Recent
29 work by Dunne et al. [24] provides evidence of incorporating self-management strategies into
30 HNC survivorship programmes. Part of this process includes trial and error techniques [37],
31 goal setting [52] and incorporation of self-management strategies [24]. As Dunne [24] reported
32 that self-management works best in the context of individualised approaches. As people,
33 cancers and treatments are different; patients may benefit from having interventions provided
34 at different times, where short and long-term interventions are used to complement each other
35 [52].
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55

56 Within the literature, there are no findings on the social experiences for people with HNC who
57 require temporary or permanent nutrition via a tube, for example, a percutaneous endoscopic
58
59
60
61
62
63
64
65

gastrostomy (PEG) or radiologically inserted gastrostomy (RIG). Further research is necessary for patients who are likely to have exacerbated challenges from specific treatments and have particular functional challenges such as laryngectomies, tracheostomies and glossectomies.

Limitations

No studies in this review had a specific aim to explore social eating experiences. Information on this topic was noted during the reporting of other topics, but the phenomenon of social eating and drinking was not explored in depth. The findings of this review did not differentiate the type or location of cancer or the treatment each person received. Further research is required to investigate the unique social eating challenges related to treatment modality or HNC subsite. Quality assessment was completed, but no study was rejected due to the quality of methodology. However, all the included papers had a score between 6 to 9 in the CASP tool, indicating that these were moderate to high quality studies. The initial process of identifying literature was completed by the first author and the process checked by the research team. To enhance rigour, this process would have been completed independently by an additional researcher.

Conclusion

The physical side effects of treatment for patients with HNC impact functional eating and drinking abilities in acute and long-term recovery. This affects both a person's ability and confidence to eat and drink in front of others, thus leading to important losses in their life. These losses have emotional, relational, and cultural significance. Many people with HNC demonstrated resilience and overcame barriers by adapting and coping with eating and drinking socially, with support from family and friends being pivotal. Family or couple orientated resources should be developed to provide support to the person with HNC and their close family.

Author Declarations

Funding: This review was undertaken as part of a PhD studentship at Ulster University (MD) and funded by the Department for the Economy (DfE) Studentship.

Conflicts of interest/competing interests: The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethics approval: N/A

Consent to participate: N/A

Consent for publication: N/A

Availability of data and material: This is a systematic review of previously published data. Data has been referenced and attributed to its source within the review.

Code availability: N/A

Authors' contributions: N/A

Reference List

1. Sobal J, Nelson M. Commensal Eating Patterns: A Community Study. *Appetite*. 2003;41(2):181-90. [https://doi.org/10.1016/s0195-6663\(03\)00078-3](https://doi.org/10.1016/s0195-6663(03)00078-3)
2. Phull S, Wills W, Dickinson A. Is Is a Pleasure Eating Together? Theoretical Reflections on Conviviality and the Mediterranean Diet. *Sociol Compass*. 2015;9(11):977-86. <https://doi.org/10.1111/soc4.12307>
3. Fischler C. Commensality, society and culture. *Social Science Information*. 2011;50(3-4):528-48. <https://doi.org/10.1177/0539018411413963>
4. Dunbar RIM. Breaking Bread: the Functions of Social Eating. *Adapt Human Behav and Physiol*. 2017;3:198-211. <https://doi.org/10.1007/s40750-017-0061-4>
5. Motteli S, Siegrist M, Keller C. Women's social eating environment and its associations with dietary behavior and weight management. *Appetite*. 2017;110:86-93. <https://doi.org/10.1016/j.appet.2016.12.014>
6. Absolom S, Roberts A. Connecting with Others: The Meaning of Social Eating as an Everyday Occupation for Young People. *J of Occupational Science*. 2011;18(4):339-49. <https://doi.org/10.1080/14427591.2011.586324>
7. Rosin P. The meaning of food in our lives: A cross-cultural perspective on eating and well-being. *J Nutr Educ Behav*. 2005;37(S2):S107-12. [https://doi.org/10.1016/s1499-4046\(06\)60209-1](https://doi.org/10.1016/s1499-4046(06)60209-1)
8. Vesnaver E, Keller H. Social Influences and Eating Behavior in Later Life: A Review. *J Nutr Gerontol Geriatr*. 2011;30(1):2-23. <https://doi.org/10.1080/01639366.2011.545038>
9. Bennell J, Taylor C. A loss of social eating the experience of individuals living with gastroparesis. *J of Clinical Nursing*. 2013;22(19-20):2812-21. <https://doi.org/10.1111/jocn.12196>

10. Rathod S, Livergant J, Klein J, Witterick I, Ringash J. A systematic review of quality of life in head and neck cancer treated with surgery with or without adjuvant treatment. *Oral Oncol.* 2015;51(10):888-900.
<https://doi.org/10.1016/j.oraloncology.2015.07.002>
11. Chan KMK, Chan HKW, Siu JYL, Nund RL, Ward EC. Impact of head and neck cancer treatment on survivors' mealtime experience. *Laryngoscope.* 2018;129(7):1572-8. <https://doi.org/10.1002/lary.27501>
12. Crowder S, Douglas K, Pepino MY, Sarma KP, Arthur AE. Nutrition impact symptoms and associated outcomes in post-chemoradiotherapy head and neck cancer survivors: a systematic review. *J Cancer Surviv.* 2018; 12:479-94.
<https://doi.org/10.1007/s11764-018-0687-7>
13. Porto de Toledo I, Pantoja LLQ, Luchesi KF, Assad DX, Canto G, Guerra ENS. Deglutition disorders as a consequence of head and neck cancer therapies: a systematic review and meta-analysis. *Support Care Cancer.* 2019; 27:3681-700. doi: 10.1007/s00520-019-04920-z
14. Ganzer H, Touger-D R, Byham-Gray L, Murphy BA, Epstein JB. The eating experience after treatment for head and neck cancer: A review of the literature. *Oral Oncol.* 2015;51(7):634-42. <https://doi.org/10.1016/j.oraloncology.2015.04.014>
15. Bressan V, Bagnasco A, Aleo G, Cantania G, Zanini MP, Timmins F, Sasso L. The life experience of nutrition impact symptoms during treatment for head and neck cancer patients: a systematic review and meta-synthesis. *Support Care Cancer.* 2017;25:1699-712. <https://doi.org/10.1007/s00520-017-3618-7>
16. Moher D, Liberati A, Tetzlaff J, Altman D. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med.* 2009;151(4):264-9. <https://doi.org/10.7326/0003-4819-151-4-200908180-00135>

17. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol*. 2008;8(45).
<https://doi.org/10.1186/1471-2288-8-45>
18. Critical Appraisal Skills Programme (2019). CASP Qualitative Studies Checklist. [online] Available at: <https://casp-uk.net/casp-tools-checklists> Accessed: 1st February 2020.
19. Long H, French D, Brooks J. Optimising the value of the critical appraisal skills programme (CASP) tool for quality appraisal in qualitative evidence synthesis. *Research Methods in Medicine and Health Sciences*. 2020;1(1):31-42.
<https://doi.org/10.1177/2632084320947559>
20. Alberda C, Alvaadj-Korenic T, Mayan M, Gramlich L. Nutrition Care in Patients with Head and Neck or Esophageal Cancer: The Patient Perspective. *Nut Clin Pract*. 2017;32(5):664-74. <https://doi.org/10.1002/ncp.10190>
21. Burges-Watson DL, Lewis S, Bryant V, Patterson J, Kelly C, Edwards-Stuart E, Murtagh M, Deary V. Altered eating: a definition and framework for assessment and intervention. *BMC Nutr*. 2018;4(14). <https://doi.org/10.1186/s40795-018-0221-3>
22. Checklin M, Bain J, Bath L, Lethbridge K. Patients' Perspectives on What Makes a Better Care Experience While Undergoing Treatment for Oropharyngeal Dysphagia Secondary to Head and Neck Cancer. *Dysphagia*. 2019;35(4):702-16.
<https://doi.org/10.1007/s00455-019-10077-y>
23. Dooks P, McQuestion M, Goldstein D, Molassiotis A. Experiences of patients with laryngectomies as they reintegrate into their community. *Support Care Cancer*. 2012;20:489-98. <https://doi.org/10.1007/s00520-011-1101-4>
24. Dunne S, Coffey L, Sharp L, Desmond D, Gooberman-Hill R, O'Sullivan E, Timmons A, Keogh I, Timon C, Gallagher P. Integrating self-management into daily

life following primary treatment: head and neck cancer survivors' perspectives. J

Cancer Surviv. 2017;13:43-55. <https://doi.org/10.1007/s11764-018-0726-4>

25. Einarsson S, Laurell G, Ehrsson YT. Experiences and coping strategies related to food and eating up to two years after the termination of treatment in patients with head and neck cancer. Eur J Cancer Care. 2019;28:e12964. <https://doi.org/10.1111/ecc.12964>
26. Ganzer H, Rothpletz-Puglia P, Byham-Gray L, Murphy BA, Touger-Decker R. 'The eating experiences in long-term survivors of head and neck cancer: a mixed methods study. J Cancer Surviv. 2015;23:3257-68. <https://doi.org/10.1007/s11764-019-00798-2>
27. Goswami S, Gupta SS. How Patients of Oral Cancer Cope Up with Impact of the Disease? A Qualitative Study in Central India. Indian J Palliat Care. 2019;25(1):103-9. https://doi.org/10.4103/IJPC.IJPC_118_18
28. Jiang N, Zhao Y, Jansson H, Chen X, Martensson J. Experiences of xerostomia after radiotherapy in patients with head and neck cancer: A qualitative study. J Clin Nurs. 2017;27:e100-8. <https://doi.org/10.1111/jocn.13879>
29. McQuestion M, Fitch M, Howell D. The changed meaning of food: physical, social and emotional loss for patients having received radiation treatment for head and neck cancer. Eur J Oncol Nurs. 2011;15(2):145-51. <https://doi.org/10.1016/j.ejon.2010.07.006>
30. Molassiotis A, Rogers M. Symptom experience and regaining normality in the first year following a diagnosis of head and neck cancer: A qualitative longitudinal study. Palliat Support Care. 2012;10(3):197-204. <https://doi.org/10.1017/S147895151200020X>

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
31. Moore KA, Ford PJ, Farah CS. "*I have quality of life...but...*": Exploring support needs important to quality of life in head and neck cancer. *Eur J Oncol Nurs*. 2014;18(2):192-200. <https://doi.org/10.1016/j.ejon.2013.10.010>
32. Mortensen GL, Paaske PB. Patients perceive tonsil cancer as a strike at psycho-socially "vital organs". *Dan Med J*. 2012;59(9):A4504.
33. Nund RL, Ward EC, Scarinci NA, Cartmill B, Kuipers P, Porceddu SV. The lived experience of dysphagia following non-surgical treatment for head and neck cancer. *Int J Speech Lang Pathol*. 2014;16(3):282-9. <https://doi.org/10.3109/17549507.2013.861869>
34. Nund RL, Ward EC, Scarinci NA, Cartmill B, Kuipers P, Porceddu SV. Survivors' experiences of dysphagia-related services following head and neck cancer: Implications for clinical practice. *Int J of Lang and Commun Disord*. 2014;49(3):354-63. <https://doi.org/10.1111/1460-6984.12071>
35. O'Brien K, Roe B, Low C, Deyn L, Rogers SN. An exploration of the perceived changes in intimacy of patients' relationships following head and neck cancer. *J Clin Nurs*. 2012;21(17-18):2499-508. <https://doi.org/10.1111/j.1365-2702.2012.04162.x>
36. Ottosson S, Laurell G, Olsson C. The experience of food, eating and meals following radiotherapy for head and neck cancer: a qualitative survey. *J Clin Nurs*. 2013;22(7-8):1034-43. <https://doi.org/10.1111/jocn.12151>
37. Parahoo RS, Semple CJ, Killough S, McCaughan E. The experience among patients with multiple dental loss as a consequence of treatment for head and neck cancer: A qualitative study. *J Dent*. 2019;82:30-7. <https://doi.org/10.1016/j.jdent.2019.01.010>
38. Pateman KA, Ford PJ, Batstone MD, Farah CS. Coping with an altered mouth and perceived supportive care needs following head and neck cancer treatment. *Support Care Cancer*. 2015;23(8):2365-73. <https://doi.org/10.1007/s00520-015-2607-y>

39. Patterson JM, McColl E, Wilson J, Carding P, Rapley T. Head and neck cancer patients' perceptions of swallowing following chemoradiotherapy. *Support Care Cancer*. 2015;23(12):3531-8. <https://doi.org/10.1007/s00520-015-2715-8>
40. Semple CJ, Rutherford H, Killough S, Moore C, McKenna G. Long-term impact of living with an obturator following a maxillectomy: A qualitative study. *J Dent*. 2019. <https://doi.org/10.1016/j.jdent.2019.103212>
41. Sterba KR, Zapla J, LaPelle N, Garriss TK, Buchanan A, Scallion M, Day T. Development of a survivorship needs assessment planning tool for head and neck cancer survivors and their caregivers: a preliminary study. *J Cancer Surviv*. 2017;11(6):822-32. <https://doi.org/10.1007/s11764-017-0621-4>
42. Tong MCF, Lee KYS, Yuen MTY, Lo PSY. Perceptions and experiences of post-irradiation swallowing difficulties in nasopharyngeal cancer survivors. *Eur J Cancer Care*. 2011;20(2):170-8. <https://doi.org/10.1111/j.1365-2354.2010.01183.x>
43. Zou Y, Li Y, Zhou X, Yu J, Xie Y, Li L, Ouyang C, Li Z, Gu M, Hicks E, Maliski S. Chinese Tongue Cancer Survivors' Perspectives One Year Post-Partial Glossectomy. *International Journal of Nursing*. 2015;4(1):34-43.
44. Lang H, France F, Williams B, Humphris G, Wells M. The psychological experience of living with head and neck cancer: a systematic review and meta-synthesis. *Psychooncology*. 2013;22(12):2648-63. <https://doi.org/10.1002/pon.3343>
45. Patterson JM, Rapley T, Carding PN, Wilson JA, McColl E. Head and neck cancer and dysphagia; caring for carers. *Psychooncology*. 2013;22(8):1815-1820. <https://doi.org/10.1002/pon.3226>
46. List MA, Rutherford JL, Stracks J, Haraf D, Kies MS, Vokes EE. An exploration of the pretreatment coping strategies of patients with carcinoma of the head and neck. *Cancer*. 2002;95(1):98-104. <https://doi.org/10.1002/cncr.10653>

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
47. Drageset S, Lindstrom TC, Underlid K. "I just have to move on": Women's coping experiences and reflections following their first year after primary breast cancer surgery. *Eur J Oncol Nurs.* 2016; 21:205-11.
<https://doi.org/10.1016/j.ejon.2015.10.005>
48. Wittmann D, Carolan M, Given B, Palapattu G, Clark P, Montie J. What Couples Say about Their Recovery of Sexual Intimacy after Prostatectomy: Toward the Development of a Conceptual Model of Couples' Sexual Recovery after Surgery for Prostate Cancer. *J Sex Med.* 2015; 12(2):494-504. <https://doi.org/10.1111/jsm.12732>
49. Cartmill B, Cornwell P, Ward E, Davidson W, Porceddu S. Long-term Functional Outcomes and Patient Perspective Following Altered Fractionation Radiotherapy with Concomitant Boost for Oropharyngeal Cancer. *Dysphagia.* 2012;27:481-90.
<https://doi.org/10.1007/s00455-012-9394-0>
50. Isaksson J, Salander P, Lilliehorn S, Laurell G. Living an everyday life with head and neck cancer 2-2.5 years post-diagnosis - A qualitative prospective study of 56 patients. *Soc Sci Med.* 2016;154:54-61.
<https://doi.org/10.1016/j.socscimed.2016.02.031>
51. So WKW, Chan RJ, Chan DNS, Hughes BGM, Chair SY, Choi KC, Chan CWH. Quality-of-life among head and neck cancer survivors at one year after treatment – A systematic review. *Eur J Cancer.* 2012; 48(15):2391-408.
<https://doi.org/10.1016/j.ejca.2012.04.005>
52. Naus MJ, Ishler MD, Parrott CE, Kovacs SA. Cancer survivor adaptation model: conceptualizing cancer as a chronic illness. *J Clin Psychol.* 2009;65(12):1350-9.
<https://doi.org/10.1002/jclp.20622>

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
53. Kristensen MB, Mikkelsen TB, Beck AM, Zwisler A, Wessel I, Diepernek KB. To eat is to practice – managing eating problems after head and neck cancer. *J Cancer Surviv.* 2019;13(5):792-803. doi: 10.1007/s11764-019-00798-2
54. Helgeson VS, Jakubiak B, Van Vleet M, Zajdel M. Communal Coping and Adjustment to Chronic Illness: Theory Update and Evidence. *Pers Soc Psychol Rev.* 2017;22(2):170-95. <https://doi.org/10.1177/1088868317735767>
55. Nund RL, Ward EC, Scarinci NA, Cartmill B, Kuipers P, Porceddu SV. [C] Carers' Experiences of Dysphagia in People Treated for Head and Neck Cancer: A Qualitative Study. *Dysphagia.* 2014;29:450-8. <https://doi.org/10.1007/s00455-014-9527-8>
56. Ostroff J, Ross S, Steinglass P, Ronis-tobin V, Singh B. Interest in and Barriers to Participation in Multiple Family Groups Among Head and Neck Cancer Survivors and Their Primary Family Caregivers. *Fam Process.* 2004;43(2):195-208. <https://doi.org/10.1111/j.1545-5300.2004.04302005.x>
57. Whittemore R, Dixon J. Chronic illness: the process of integration. *J Clin Nurs.* 2008;17(7b):177-87. <https://doi.org/10.1111/j.1365-2702.2007.02244.x>

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6, 9, 38-39
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-7

Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	8
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	10
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	10

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	9-10
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	12-17
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	41-42
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	12-17
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10-11,18-21
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	22-25

15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	25
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	25
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	26

Pubmed (1091) (17.2.20)

- 1) Head and neck cancer*
- 2) Head and neck neoplasm*
- 3) Head and neck tumour*
- 4) Head and neck tumor*
- 5) Oral cancer*
- 6) Oral neoplasm*
- 7) Oral tumour*
- 8) Oral tumor*
- 9) Mouth cancer*
- 10) Mouth neoplasm*
- 11) Mouth tumour*
- 12) Mouth tumor*
- 13) Larynx* cancer*
- 14) Larynx* neoplasm*
- 15) Larynx tumour*
- 16) Larynx tumor*
- 17) Pharynx* cancer*
- 18) Pharynx* neoplasm*
- 19) Pharynx* tumour*
- 20) Pharynx tumor*
- 21) 1 – 20 OR
- 22) eat*
- 23) drink*
- 24) food
- 25) swallow*
- 26) deglutition
- 27) dysphagia
- 28) 22 – 27 OR
- 29) social*
- 30) relation*
- 31) experience*
- 32) 29 – 31 OR
- 33) 21 AND 28 AND 32

Scopus (1437) (17.2.20)

- 1) Head and neck cancer*
- 2) Head and neck neoplasm*
- 3) Head and neck tumor?r*
- 4) Oral cancer*
- 5) Oral neoplasm*
- 6) Oral tumor?r*
- 7) Mouth cancer*
- 8) Mouth neoplasm*
- 9) Mouth tumor?r*
- 10) Larynx* cancer*
- 11) Larynx* neoplasm*
- 12) Larynx* tumor?r*
- 13) Pharynx* cancer*
- 14) Pharynx* neoplasm*
- 15) Pharynx* tumor?r*
- 16) 1 – 15 OR
- 17) eat*
- 18) drink*
- 19) food
- 20) swallow*
- 21) deglutition
- 22) dysphagia
- 23) 17 – 22 OR
- 24) social*
- 25) relation*
- 26) experience*
- 27) 24 – 26 OR
- 28) 16 AND 23 AND 27

PsycINFO (57) (17.2.20)

- 1) Head and neck cancer* - kw
- 2) Head and neck neoplasm* - kw
- 3) Head and neck tumor?r* - kw
- 4) Oral cancer* - kw
- 5) Oral neoplasm* - kw
- 6) Oral tumor?r* - kw
- 7) Mouth cancer* - kw
- 8) Mouth neoplasm* - kw
- 9) Mouth tumor?r* - kw
- 10) Larynx* cancer* - kw
- 11) Larynx* neoplasm* - kw
- 12) Larynx* tumor?r*
- 13) Pharynx* cancer* - kw
- 14) Pharynx* neoplasm* - kw
- 15) Pharynx* tumor?r - kw
- 16) 1 – 15 OR
- 17) eat* - kw
- 18) drink* - kw
- 19) food - kw
- 20) food - SH
- 21) swallow* - kw
- 22) swallowing - SH
- 23) deglutition - kw
- 24) dysphagia – SH
- 25) dysphagia - kw
- 26) 17 – 25 OR
- 27) social* - kw
- 28) relation* - kw
- 29) experience* - kw
- 30) 27 – 29 OR
- 31) 16 AND 26 AND 30

CINAHL (631) (17.2.20)

- 1) Head and neck cancer* - kw
- 2) Head and neck neoplasm* - kw
- 3) Head and neck tumo?r* - kw
- 4) Head and neck neoplasms – MH
- 5) Oral cancer* - kw
- 6) Oral neoplasm* - kw
- 7) Oral tumo?r - kw
- 8) Mouth cancer* - kw
- 9) Mouth neoplasm* - kw
- 10) Mouth tumo?r – kw
- 11) Mouth neoplasms – MH
- 12) Laryn* cancer* - kw
- 13) Laryn* neoplasm* - kw
- 14) Laryn* tumo?r* - kw
- 15) Laryngeal neoplasms – MH
- 16) Pharyn* cancer* - kw
- 17) Pharyn* neoplasm* - kw
- 18) Pharyn* tumo?r - kw
- 19) Pharyngeal neoplasms – MH
- 20) 1 – 19 OR
- 21) eat* - kw
- 22) eating - MH
- 23) drink* - kw
- 24) Food – kw
- 25) Food – MH
- 26) Swallow* - kw
- 27) Deglutition – MH
- 28) Dysphagia - kw
- 29) deglutition disorders - MH
- 30) Deglutition - kw
- 31) 21 – 30 OR
- 32) social* - kw
- 33) relation* - kw
- 34) experience* - kw
- 35) 31 – 34 OR
- 36) 20 AND 31 AND 35

Web of Science (1373) (17.2.20)

- 1) Head and neck cancer*
- 2) Head and neck neoplasm*
- 3) Head and neck tumo?r*
- 4) Oral cancer*
- 5) Oral neoplasm*
- 6) Oral tumo?r*
- 7) Mouth cancer*
- 8) Mouth neoplasm*
- 9) Mouth tumo?r*
- 10) Laryn* cancer*
- 11) Laryn* neoplasm*
- 12) Laryn* tumo?r*
- 13) Pharyn* cancer*
- 14) Pharyn* neoplasm*
- 15) Pharyn* tumo?r*
- 16) 1 – 15 OR
- 17) eat*
- 18) drink*
- 19) food
- 20) swallow*
- 21) deglutition
- 22) dysphagia
- 23) 17 – 22 OR
- 24) social*
- 25) relation*
- 26) experience*
- 27) 24 – 26 OR
- 28) 16 AND 23 AND 27

Key:
MH – Medical heading
SH – Subject heading
kw - keyword

EMBASE (2316) 17.2.20

- 1) Head and neck cancer - MH
- 2) Mouth tumor – MH
- 3) Pharynx cancer – MH
- 4) Head and neck cancer* - kw
- 5) Head and neck neoplasm* - kw
- 6) Head and neck tumo?r* - kw
- 7) Oral cancer* - kw
- 8) Oral neoplasm* - kw
- 9) Oral tumo?r* - kw
- 10) Mouth cancer* - kw
- 11) Mouth neoplasm* - kw
- 12) Mouth tumo?r - kw
- 13) Larynx* cancer* - kw
- 14) Larynx* neoplasm* - kw
- 15) Larynx* tumo?r* - kw
- 16) Pharynx* cancer* - kw
- 17) Pharynx* neoplasm* - kw
- 18) Pharynx* tumo?r*
- 19) 1 – 18 OR
- 20) eating – SH
- 21) dysphagia - SH
- 22) food – SH
- 23) Swallowing - SH
- 24) eat* - kw
- 25) drink*
- 26) dysphagia – kw
- 27) deglutition - kw
- 28) swallow* - kw
- 29) food - kw
- 30) 20 – 29 OR
- 31) experience - SH
- 32) social* - kw
- 33) relation* - kw
- 34) experience* - kw
- 35) 31 – 34 OR
- 36) 19 AND 30 AND 34

Systematic Review Screening Tool (Version 3)

Review Question: What are the social eating and drinking experiences for people living with and beyond head and neck cancer (HNC) and their family?

Reviewer name:

Date:

Authors:

Year:

Title:

Journal:

Population	Include <input type="checkbox"/> Patients aged 18 or over	Exclude <input type="checkbox"/> Patients under age of 18
Type of cancer	Include <input type="checkbox"/> Head and neck cancer	Exclude <input type="checkbox"/> All other types of cancer <input type="checkbox"/> Data cannot be separated according to cancer type
Treatment	Include <input type="checkbox"/> Surgery, radiotherapy, chemotherapy or combination	Exclude <input type="checkbox"/> End-of-life
Exposure	Include <input type="checkbox"/> Eating and drinking difficulties following HNC treatment <input type="checkbox"/> Challenges with food and drink following HNC treatment	Exclude <input type="checkbox"/> Eating and drinking difficulties during HNC treatment
Outcome	Include <input type="checkbox"/> Social experience involving eating and drinking or food and drink <input type="checkbox"/> Social experience involving a place associated with food or drink	Exclude <input type="checkbox"/> Social experience not involving eating and drinking or food and drink
Research type	Include <input type="checkbox"/> Primary research	Exclude <input type="checkbox"/> Secondary research, systematic reviews, opinion articles, editorials, abstract only available
Study design	Include <input type="checkbox"/> Any	Exclude Not excluded due to design
Overall decision with reason	<input type="checkbox"/> INCLUDED	<input type="checkbox"/> EXCLUDED

Notes:

	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between research and participants been adequately addressed?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. Overall score
Alberda et al. (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Burges-Watson et al. (2018)	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	8
Checklin et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Dooks et al. (2012)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Dunne et al. (2019)	Yes	Yes	Can't tell	Yes	Yes	No	Yes	Yes	Yes	7
Einarsson et al. (2019)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
Ganzer et al. (2015)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Goswami & Gupta (2019)	No	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	6
Jiang et al. (2017)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
McQuestion et al. (2011)	Yes	Yes	Yes	Yes	Yes	No	Can't tell	Yes	Yes	7
Molassiotis and Rogers (2012)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Moore et al. (2014)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	7

Mortensen & Paaske (2012)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between research and participants been adequately addressed?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. Overall score
Nund et al. (A) (2014)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Nund et al. (B) (2014)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
O'Brien et al. (2012)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Ottosson et al. (2013)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Parahoo et al. (2019)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
Pateman et al. (2015)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
Patterson et al. (2015)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Semple et al. (2019)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	7
Sterba et al. (2017)	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Can't tell	6
Tong et al. (2011)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8
Zou et al. (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9

15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

Please wait...

If this message is not eventually replaced by the proper contents of the document, your PDF viewer may not be able to display this type of document.

You can upgrade to the latest version of Adobe Reader for Windows®, Mac, or Linux® by visiting http://www.adobe.com/go/reader_download.

For more assistance with Adobe Reader visit <http://www.adobe.com/go/acrreader>.

Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries. Mac is a trademark of Apple Inc., registered in the United States and other countries. Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.

Please wait...

If this message is not eventually replaced by the proper contents of the document, your PDF viewer may not be able to display this type of document.

You can upgrade to the latest version of Adobe Reader for Windows®, Mac, or Linux® by visiting http://www.adobe.com/go/reader_download.

For more assistance with Adobe Reader visit <http://www.adobe.com/go/acrreader>.

Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries. Mac is a trademark of Apple Inc., registered in the United States and other countries. Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.

Please wait...

If this message is not eventually replaced by the proper contents of the document, your PDF viewer may not be able to display this type of document.

You can upgrade to the latest version of Adobe Reader for Windows®, Mac, or Linux® by visiting http://www.adobe.com/go/reader_download.

For more assistance with Adobe Reader visit <http://www.adobe.com/go/acrreader>.

Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries. Mac is a trademark of Apple Inc., registered in the United States and other countries. Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.

Please wait...

If this message is not eventually replaced by the proper contents of the document, your PDF viewer may not be able to display this type of document.

You can upgrade to the latest version of Adobe Reader for Windows®, Mac, or Linux® by visiting http://www.adobe.com/go/reader_download.

For more assistance with Adobe Reader visit <http://www.adobe.com/go/acrreader>.

Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and/or other countries. Mac is a trademark of Apple Inc., registered in the United States and other countries. Linux is the registered trademark of Linus Torvalds in the U.S. and other countries.